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International cooperation to reduce the impact of the El Niño phenomenon

Report of the Secretary-General

Summary

The present report is submitted in pursuance of General Assembly resolutions 52/200, 53/185, 54/220 and 55/197. The report builds on previous reports of the Secretary-General on this subject (A/53/487, A/54/135-E/1999/88, and A/55/99-E/2000/86) and reviews ongoing activities designed to reduce the impact of the El Niño phenomenon, as well as the initial recommendations of the Working Group on Climate and Disasters, which has been established under the leadership of the World Meteorological Organization. These recommendations include the need for the effective coordination of information flows between different agencies of the United Nations system on future El Niño events.

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I. Background

1. The term El Niño, although not rigorously defined,[1] is associated with a major warming of the surface layers of the central and eastern equatorial Pacific Ocean. An El Niño event occurs when warm water flows eastward from the warm pool of the western tropical Pacific Ocean and there is a reduction in upwelling of cold water in the eastern equatorial Pacific Ocean and along the Pacific coast of the Americas. Once initiated, typically during the late Northern Hemisphere spring or early summer, an El Niño event typically lasts about a year, although associated climate anomalies in some parts of the globe may persist. Of all abnormal weather and climatic events, the El Niño is perhaps the phenomenon most likely to lead to extensive natural hazards with the potential to seriously affect humankind. This assertion is well supported by the outcomes of the 1997/98 El Niño, which is now generally recognized as one of the most intense and devastating in recorded history. Nonetheless, in a number of locations commonly affected by El Niño events, notably in Southern Africa and Australia, its impacts were not as severe as the previous El Niño of 1982/83. These differences attest to the complexity of the natural climate system, in which even the effects of the El Niño phenomenon can be modulated significantly by the different rhythm of other varying physical processes that are linked to the El Niño Southern Oscillation (ENSO).

2. The shifting of seasonal weather patterns triggered by the 1997/98 El Niño event produced climate extremes over many parts of the globe, often with major social and economic impacts. More than 24,000 lives were lost because of the intense storms, producing high winds, floods and storm tides, that occurred during this period. Overall, it is estimated that 110 million people were affected, including more than 6 million people who were displaced as community infrastructures, including housing, food storage, transport and communications, were lost during storms. The direct value of losses exceeded 34 billion United States dollars. While the waterlogging of fields led to reduced agricultural production in many parts of the world, in other regions the absence of the usual seasonal storms and rains led to prolonged dry spells, loss of crops and reduction in water supplies. Furthermore, increased incidence of disease occurred due to the prolonged disruption to weather and rainfall patterns, which resulted in contamination of water supplies and a more favourable environment for disease-carrying insect vectors.

3. The intense 1997/98 El Niño event was rapidly replaced by La Niña conditions, which set in during the latter half of 1998, prevailed through 1999 and continued into 2001. This La Niña phase appears to have brought its own set of disasters in many areas of the world. A thorough analysis, such as that carried out on the preceding La Niña phase, has not, however, yet been undertaken. As of April 2001, there is evidence beginning to emerge of a shift in ENSO signals in the Equatorial Pacific from the remnant weak (cool) La Niña conditions of the past several months towards the (warm) El Niño phase. The timing in the annual cycle is propitious for such a shift. It is also four years since the last event and El Niño events, during the last 30 years, have reappeared at varying intensities around four to six years apart.

II. Institutional context

4. Following the adoption of General Assembly resolution 52/200 on 18 December 1997, the Inter-Agency Task Force on El Niño was created within the framework of the International Decade for Natural Disaster Reduction. The Task Force provided a platform for combining efforts to improve understanding of the El Niño phenomenon, disseminating early warnings prior to the events and providing technical assistance for capacity-building resources to Member States threatened or affected by El Niño/La Niña-related disasters.

5. At the fifty-fifth session of the General Assembly, the Secretary-General submitted a report, through the Economic and Social Council, on progress made on international cooperation to reduce the impact of the El Niño phenomenon (A/55/99-E/2000/86), as requested in Assembly resolution 54/220 of 22 December 1999. The Assembly welcomed the establishment of the Working Group on Climate and Disasters, established by the Inter-Agency Task Force on Disaster Reduction and chaired by the World Meteorological Organization (WMO) (previously named the Working Group on the El Niño/La Niña phenomenon), as a means of ensuring continuity of the international cooperation to reduce the impact of the El Niño phenomenon. The broader mandate of the Working Group would also enable it to consider other climate aspects of disasters within the

framework of the Inter-Agency Task Force for Disaster Reduction.

6. The Working Group on Climate and Disasters is complemented by three other thematic working groups dealing with strategic disaster reduction issues: early warning; the quantification of risk and vulnerability; and wildland fires.

7. The General Assembly also noted with appreciation the efforts made to reduce the impact of natural disasters related to the El Niño phenomenon through improved scientific understanding, close monitoring and the dissemination of timely forecasts to communities at risk and, in particular, the efforts of those agencies supporting the Climate Agenda.[2]

8. The General Assembly called upon the organizations and bodies of the United Nations system and other intergovernmental organizations, especially the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (UNESCO), WMO, the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP) and the United Nations Development Programme (UNDP), as well as the International Council for Science, the International Research Institute for Climate Prediction, the Pan American Health Organization and the International Federation of the Red Cross and Red Crescent Societies, to adopt, within the framework of the International Strategy for Disaster Reduction, a comprehensive approach to the study of El Niño and related phenomena and to intensify their cooperation with the affected regions with special reference to small island developing States and landlocked countries.

9. The General Assembly also invited States and other organizations participating in the International Strategy for Disaster Reduction to provide technical and financial assistance, including national capacity-building, to developing countries to support global and regional observation systems and research, including the dissemination of data on El Niño and related phenomena, to prevent, mitigate and redress the negative effects.

III. Working Group on Climate and Disasters

A. Structure

10. The Working Group on Climate and Disasters was set up with the understanding that the principal factor responsible for the increase in the social and economic impacts of natural disasters is the increasing level of vulnerability of many communities. The extent to which climate change and variability add to or reinforce vulnerability depends upon many factors. The Working Group on Climate and Disasters is seeking to ensure that climactic timescale factors are appropriately incorporated in the work carried out under the International Strategy for Disaster Reduction.

11. The structure of the Working Group is based on the need for effective dialogue and cooperation on climate information amongst the scientific and technical areas of the United Nations system and its operational responsibilities in the fields of disaster management, humanitarian assistance, sustainable development, technical cooperation and capacity-building, including data collection, monitoring and early warning systems, at all levels. The objectives of this cooperation are to ensure the concrete application of knowledge and technology in building coping capacities, stimulating economic development, constructing safe infrastructures and networks and promoting sustainable approaches to environmental issues. In keeping with its lead role on science and technology in the Inter-Agency Task Force on El Niño, WMO has been designated as the Working Group leader by the Inter-Agency Task Force for Disaster Reduction. The members of the Working Group comprise UNDP, UNESCO, UNEP, the United Nations University, FAO, the South Pacific Applied Geoscience Commission, the Organization of American States (OAS), the Inter-American Committee for Natural Disaster Reduction, the Asian Disaster Preparedness Centre, the International Research Institute for Climate Prediction, the South African Development Community (SADC)/Intergovernmental Authority on Development (IGAD) drought monitoring centres (DMC) and the Munich Reinsurance (Munichre).

B. Priorities

12. The Working Group on Climate and Disasters, which met in Geneva on 10 and 11 April 2001, established two priority areas of focus. Its initial product is a review of sectoral monitoring and warning systems, both within and outside the United Nations System. Phenomena related to ENSO and other large-scale climatic systems, such as monsoons, negatively affect various sectors of society, principally through the extreme events associated with them on a range of timescales. Medium- to long-term climate forecasts linked to systematic assessments of related vulnerabilities are becoming increasingly important for successful risk reduction activities in all domains. Sectors such as public health, agriculture and food security, natural resource management, tourism and private enterprises can increase their resilience to extreme events through increased access, better understanding and judicious use of medium- to long-term climate forecasts.[3] Such climate forecasts, if used appropriately, can also provide key advanced information for disaster reduction in support of prevention and preparedness.

13. The purposes of the review are to:

(a) Identify medium- and long-range climate forecasting capabilities at the regional level, including key actors and stakeholders in sectoral monitoring processes;

(b) Assess how regional climate forecasts on medium- and long-range time scales are communicated to users by the National Meteorological Services;

(c) Assess how, at the national level, medium- and long-range climate forecasts are scaled down to the local level, including the identification of deficiencies in the information transfer process and the support needed in particular countries.

The review will also identify capacities that exist at the national level for interpretation and application of medium- to long-range climate forecasts for different sectors and for the development of sectoral responses, including capacities across different sectors to reduce related vulnerabilities as well as shortfalls in the coverage (sectoral and geographical) of climate monitoring.

14. The second priority relates to the continuation of the mandate of the Inter-Agency Task Force on El Niño, namely to support international cooperation to reduce the impact of the El Niño phenomenon and, in particular, to prepare for the next El Niño event. Prior to the establishment of the Inter-Agency Task Force on El Niño, the United Nations system was not in a position to provide optimal support for the dissemination of early warnings and for the channelling of technical assistance and capacity-building resources to Member States threatened by El Niño/La Niña related disasters. The Working Group will therefore support, on an ongoing basis, the broad framework of the United Nations system to operate more effectively when there is a raised level of probability that an El Niño event might develop.

IV. Related activities

15. In pursuance of General Assembly resolution 52/200, a number of activities were carried out at the global, regional and national levels, aimed at reducing the impact of future El Niño phenomena and similar climatic variables. Such efforts relate to the study of lessons learned from the 1997/98 El Niño event, both from a scientific and technical perspective and through the application of seasonal to interannual forecasts and related societal efforts to reduce vulnerability.

16. With the generous support of the Government of Ecuador, the Inter-Agency Task Force on El Niño and the Permanent Commission for the South Pacific convened the first global assessment of the 1997/98 El Niño event in Guayaquil, Ecuador, from 9 to 13 November 1998. The meeting provided an opportunity for a substantive dialogue between the scientific and technological constituencies and their operational partners in disaster prevention, humanitarian disaster management and operational development, as well as an opportunity for the Inter-Agency Task Force to commission a thorough scientific and technical analysis of the 1997/98 El Niño event. This analysis was prepared by WMO, with financial and technical support from UNEP, the Intergovernmental Oceanographic Commission (IOC) of UNESCO and the International Council for Science. The report was published just prior to the fifty-fourth session of the General Assembly.

17. The Guayaquil meeting also inspired the development of a project to assess the impact of the El Niño event on 16 developing countries around the world, carried out by UNEP, WMO, the National

Center for Atmospheric Research, the United Nations University and the United Nations secretariat for the International Strategy for Disaster Reduction. The 16 countries are Bangladesh, China, Costa Rica, Cuba, Ecuador, Ethiopia, Fiji, Indonesia, Kenya, Mozambique, Panama, Papua New Guinea, Paraguay, Peru, Philippines and Viet Nam. The project entitled "Reducing the impact of environmental emergencies through early warning and preparedness: the case of the 1997/98 El Niño", is a review of both forecasts and impacts of the 1997/98 event, as well as climate-related early warning and natural disaster preparedness, for the improvement of ENSO and other climate related coping mechanisms in these countries.

18. The overriding purpose of the project was to identify what worked and what did not work with regard to societal responses to the forecasts and impacts of the 1997/98 El Niño event. The approach adopted was to assess what might have been done differently had a perfect forecast been available several months in advance of the onset of El Niño in March 1997. Based on this assessment, several lessons were learned in each country and many of the lessons proved to be applicable to other countries. The project was initiated with support from the United Nations Fund for International Partnerships. A report was presented at the fifty-fifth session of the General Assembly (A/55/99-E/2000/86).

19. In accordance with its lead role on science and technology in the Inter-Agency Task Force on El Niño, WMO carried out a feasibility study for an international centre for the research on the El Niño phenomenon to be established in Guayaquil, as advocated in the Declaration of Guayaquil. The study benefited from discussions carried out during a WMO mission to Ecuador from 27 January to 7 February 1999. The proposed centre has the full support of the Government of Ecuador and the national and regional institutions with which it would cooperate. Tangible support might also be expected from the wider international climate science constituency. The centre would have two main functions: to promote and undertake research on the ENSO phenomenon and mathematical modelling to permit "downscaling" of global climate predictions to regional and national scales; and to provide outreach services to the community of users of ENSO data and predictions.

20. The World Climate Programme/Climate Information and Prediction Services project is working on developing a coherent, global framework for effective seasonal to interannual climate prediction and dissemination to serve national meteorological and hydrological services. This project carries out pilot/demonstration projects, training seminars and workshops on operational climate, which include climate computing (CLICOM)/Climate Information and Prediction Services (CLIPS) training activities, to address regional capacity-building, early warning of El Niño-related climate extremes and associated disasters.

21. A number of regional climate outlook forums were held during the last El Niño phenomenon and the subsequent La Niña event. The climate outlook forums are held in view of the level of understanding of the causes of seasonal to internal climate variables, which has improved substantially. In addition to the development of this understanding is the enhanced capability to provide outlooks of the climatic atmospheric state for one or more seasons in advance, which facilitates advance planning and hence contributes to the reduction of climatic shocks.

22. In October 2000 in Pretoria, a Global review of regional climate outlook forums was carried out. Participants recognized the significant role the regional Climate Outlook Forums had played in capacity-building in many parts of the world, as well as the links the forums had helped to develop between meteorologists and end-users of seasonal forecasts. The Forums stimulated interest in and created recognition of the impact of internal climate variability and provided the assistance to develop capacities that both mitigate against these impacts and help adapt to climate variabilities, such as El Niño. The review provided a number of recommendations to further enhance the service provided by the Climate Outlook Forums in respect of regional issues, capacity-building, the delivery of products and other technical subjects.

23. The Asian Disaster Preparedness Centre, in collaboration with the United States National Oceanic and Atmospheric Administration (NOAA) and with support from the United States Office of Foreign Disaster Assistance, initiated the Extreme Climate Events programme, as a follow up to the Asian regional meeting on the El Niño-related crisis, held in February 1998. The programme sets out to improve the understanding of the impact of extreme climate events, such as the El Niño and La Niña, on society and the environment in selected Asian countries through the effective application of climate forecast information.

24. In September 1999, the Inter-American Development Bank and WMO signed an agreement to carry out a study on the prediction and amelioration of socio-economic impacts of El Niño Southern Oscillation (ENSO) in Latin America and the Caribbean countries, which began on March 2000. It will be carried out over a period of 18 months (see annex).

25. A regional workshop to assess climate variability impacts on water resources was convened by the South Pacific Applied Geoscience Commission and held in Nadi, Fiji, in October 1999. It was supported by the British High Commission (Fiji), UNEP, NOAA, South Pacific Regional Environment Programme and WMO. The workshop brought together climate scientists/meteorologists, water resources managers and disaster managers from all Pacific Island countries. Discussions and recommendations focused on the identification of the users of climate forecast information and recognition of their needs; the identification of adaptation and mitigation strategies; and the strengthening of linkages between the producers and users of climate information. Scientists from the Pacific ENSO Application Centre (Honolulu), NOAA's Climate Prediction Center and the International Research Institute for Climate Prediction worked with regional scientists as resource personnel. The country papers presented by national Governments were the first compilation of information on the impacts of the 1997/98 El Niño event throughout the region.

26. Meteorologists identified the need for free and unrestricted flow of information and the upgrading of skills in ENSO forecasts. Disaster and water resources managers urged more detailed analysis of the hydrological output of rainfall data, specifically the development of local capacity to generate simple, timely and accessible forecasts of monthly rainfall and streamflows. In the widely dispersed region of the Pacific, the small island developing States need to freely access the technical information available in developed countries and professional institutions.

27. Other activities that bridge the gap between forecasts and end-users include the International Geosphere-Biosphere Programme's (IGBP) Global Change System for Analysis, Research and Training (START) Climate Prediction and Agriculture (CLIMAG) programme, which focuses on applications of forecasts in agriculture, with pilot projects in several areas of the world. A European project, "PROMISE", also has a major component on agricultural applications. The NOAA Office of Global Programs and the international research institute for climate prediction have arranged a number of pilot projects around the world. Other key players include the Pacific ENSO Application Center in Hawaii, the Agricultural Production Systems Research Unit in Queensland, Australia, as well as national meteorological services in a number of countries.

V. Recommendations

28. During the 1997/98 event, the El Niño Task Force assisted in the coordination of the information flow between different agencies of the United Nations system on the development of the event. The information brought together under this arrangement also proved valuable for a wider audience seeking an authoritative voice on the event, including predictions of its likely course over time. The Working Group on Climate and Disasters, under the leadership of WMO should continue to gather information on how climate information is generated and distributed globally, regionally and locally. It should also give consideration to how improvements can be made in the distribution and transfer of this information, including climate forecasts, to different sectors can improve its effectiveness in disaster preparedness.

29. The Working Group on Climate and Disasters should continue activities in the areas of advocacy and education. It is important, for example, that the recommendations attributable to the lessons learned from the 1997/98 El Niño be made widely available to Governments, decision-makers and communities. These guidelines should also be provided to United Nations organizations, related specialized agencies, as well as non-governmental organizations (NGOs) active in this field. In particular, the Working Group on Climate and Disasters should ensure the experience gained from the intergovernmental meeting of experts held in Guayaquil in November 1998, the scientific and technical retrospective of the 1997/98 El Niño, the study entitled "Once Burned, Twice Shy", the relevant lessons learned exercises from Asia, Latin America and Africa, the review of the Climate Outlook Forum and other pertinent studies be made available to all interested parties.

30. With respect to sector specific activities, events such as regional workshops to examine the impacts of extreme weather and climate-related phenomena on social and economic activities in the field of agriculture, water resources and human health should be encouraged, especially in developing countries. These forums should also be supported in which the scientific community can interact with user communities on an ongoing basis, providing weather and climate information to develop best strategies for minimizing the adverse effects of expected patterns of climate variability and extremes.

31. The Working Group on Climate and Disasters should continue supporting studies such as the review of sectoral monitoring and warning systems, both within and outside of the United Nations system in order to establish shortfalls in the coverage (sectoral and geographical) of climate monitoring, as well as to explore further applications of climate monitoring information and forecasts.

32. The secretariat for the International Strategy for Disaster Reduction, supported by the Working Group on Climate and Disasters of the Inter-Agency Task Force for Disaster Reduction, should promote strategies to reduce the negative impacts caused by climate anomalies, such as ENSO, in the 10-year review of the outcome of the United Nations Conference on Environment and Development, both globally and in regional preparations, in order to ensure that the issue is included in the proceedings of the World Summit on Sustainable Development, to be held in Johannesburg in 2002. These activities should be linked to other relevant strategic platforms, such as Agenda 21, the Climate Agenda and the environmental-related conventions that emerged from the United Nations Conference on Environment and Development.

33. The inseparability of El Niño from broader issues of climate change underscores the importance of a concerted effort on the part of Governments and NGOs to maintain a healthy observation system, to continue research into climate variability, to improve forecast skills and to develop appropriate policies for reducing the impact of climate extremes. The 1997/98 El Niño event clearly demonstrated the usefulness of developing capabilities in the areas of climate monitoring and prediction.

34. In recent years the level of scientific understanding of the causes of seasonal to interannual climate variability has improved substantially, owing in large part, to the sustained availability of real-time in situ and remotely-sensed satellite data from the present ENSO observing system. These data are essential for further model development. However, continued progress in filling existing gaps in our knowledge depends on maintaining and improving the ENSO observing system. The system currently consists of a mix of operational and prototype sub-systems including drifting buoys, the Tropical Atmosphere Ocean Project (TAO)-Triangle Trans-Ocean Buoy Network (TRITON) moorings, the observing ship lines of the Ship of Opportunity (SOOP) and the Voluntary Observing Ship (VOS) programmes, tide gauges and satellite instruments. Components of the operational system are under continuous national budget pressures and critical satellite follow-on missions for measurements of winds, altimetry, and the like, are not assured in the future. The high potential for significant improvements in seasonal to interannual climate forecasting, as demonstrated by the growing but still limited skill of computer-based climate models, will not be realized without continued support for and enhancement of the observing system.

35. Experience has highlighted the need for the different working groups established by the Inter-Agency Task Force for Disaster Reduction to ensure complementarity in their projected outputs. Given the inextricable relationships between climate variability, social and economic vulnerability and the effectiveness of early warning systems for natural disasters, it is imperative that the Inter-Agency Task Force and the United Nations secretariat for the International Strategy for Disaster Reduction ensure functional synergies between the various working groups dealing with these matters.

Notes

[1] The changes in weather and climate patterns across the Pacific Ocean associated with El Niño are one extreme of what is referred to as the Southern Oscillation and the overall coupled ocean-atmosphere processes are referred to as El Niño Southern Oscillation, or ENSO. The other extreme of the Southern Oscillation is associated with colder than normal waters over the eastern equatorial Pacific Ocean and a piling up of warm waters in the west and is referred to as a La Niña event. The two extremes are often referred to as the warm phase and cold phase of ENSO, respectively, indicating that they appear to be part of a single phenomenon.

[2] The Climate Agenda is the organizational framework under Agenda 21 for coordinating international climate activities and for further developing regional and global infrastructures for understanding the climate system.

[3] Climate forecasts on monthly through seasonal to interannual forecasts are sometimes referred to simply as long-range (weather) forecasts. It must be stressed, however, that forecasts on this timescale cannot predict the occurrence or onset of any particular weather event. Typically, climate forecasts are expressed in terms of probabilities of specific thresholds being met, for example, below average, average, above average. Some inferences about extreme event probabilities might also be included.

Annex

Study on the feasibility of forecast and reduction of the socio-economic impacts of the El Niño Southern Oscillation in Latin America and the Caribbean

1. A project financed by the Inter-American Development Bank, with the technical support of the World Meteorological Organization (WMO), is currently being carried out in Latin American and Caribbean countries. This study, which started in March 2000 and is due to be finalized in September 2001, is examining the question of prediction and amelioration of the socio-economic impacts of the El Niño Southern Oscillation (ENSO) in Latin America and the Caribbean countries.

2. The study will establish a regional system to provide an early warning of an impending El Niño and thus ameliorate its socio-economic impacts. The project will:

(a) Evaluate existing institutional and technical capabilities for data analysis and quantify the human resources and capacity-building needed;

(b) Analyse vulnerability to El Niño in selected countries to identify the more vulnerable sectors and population groups, prepare case studies, assess institutional preparedness to cope with El Niño effects and produce simulations to predict the impacts of El Niño events on the economy;

(c) Make a preliminary system design and feasibility study of the requirements for an early warning system; this component will include a training session aimed at user communities in agriculture, fisheries, energy, water management, disaster-preparedness and health;

(d) Determine the economic value of additional information using a cost-benefit analysis;

(e) Hold a policy workshop to inform and obtain inputs from policy-makers and advisers;

(f) Design implementation plans and project proposals for early warning systems for interested countries or groups of countries, with at least one subregional proposal for Central America, South America and the Caribbean.

3. Preliminary findings highlight some of the difficulties encountered in implementing a potential early warning system in the context of a climatic variable such as El Niño. These include: (a) limited capacity to develop weather reports; (b) the lack of strategies for broadcasting technical information to a number of users; and (c) the failure of institutional communication to translate forecast information into concrete preventative action.

4. Some of the initial recommendations point to the current opportunities in Latin America and the Caribbean for implementing El Niño early warning systems and supporting disaster prevention owing to the fact that legal standards related to the prevention of natural disasters are currently being improved in a number of countries. These changes have taken place following the negative experiences related to the 1997/98 El Niño.

5. Encouragingly, it can be noted that, as a result of the lessons learned from the 1997/98 El Niño, a number of countries in Latin America and the Caribbean are carrying out initiatives aimed at reducing their vulnerability in the face of abnormal weather conditions. Several countries have improved their legislation in order to take proactive measures to reduce the impact of future events.